

create a vague impression. For example, in dealing with the question of acceleration, we find stated:—"Let a body move in a straight line, and measure its velocity. At one instant it is 200 cm. per second; 10 seconds later it is 350 cm. per second." Yet there is no indication of the mode of measurement, nor is an instantaneous velocity even defined. Further, a considerable amount of space is wasted in rather absurd diagrams of common objects to which the principles of physics apply, and in portrait drawings of various famous physicists, both of which features the authors regard as likely to stimulate the interest of students. Speaking generally, it may be said that this book contains too much detail for a popular exposition, and too little exact information for truly scientific study.

(5) Several curious features are to be found in the laboratory manual also. It is intended to accompany the theoretical treatment in the previous book, to which reference is always made in connection with the experiments. One cannot help thinking that some of the observations are purely imaginary, and not actually carried out by the students. Experiment 36, for instance, is on the measurement of the velocity of sound in air with a stop-watch and a gun. Two boys are required at about a mile apart. The one has a gun and the other a stop-watch. The usual procedure follows. If a breeze is blowing, the observers should *change positions*, and so on. An alternative, and equally absurd, method is also described. Most of the experimental work is quite simple, but the instructions are not always clear, and considerable individual help on the part of the teacher would be indispensable to the students. The printing, both in this book and the accompanying one, is very good.

(6) Prof. Ebert's book is a large volume comprising the theoretical treatment of mechanics and heat. In using the word "mechanics," however, it must be understood that the first section of the book is concerned with sound, and what is usually styled "properties of matter," even more than with mechanics in the sense of applied mathematics. Indeed, the somewhat disordered mixture of these subjects is the only serious objection to the book. It is difficult to understand, for instance, why the definitions of the absolute units of force and work are postponed to so late a stage (p. 216), especially in view of the fact that such subjects as elasticity and osmotic pressure have been considered previously.

The second part of the book is distinctly superior to the first. A more logical treatment renders it more easy to follow, the subject is considered in greater detail, and none of the important

principles of thermo-dynamics nor their applications are omitted. Taken on the whole, the book is a good one, and has evidently been prepared with great care. One of the chief features is the large number of experiments which are described—in fact, the book is essentially an experimental treatise. These experiments are illustrated with carefully prepared diagrams, and numerous numerical examples form a useful addition to the text.

(7) This is yet another practical physics manual, compiled in this case for the students in Calcutta University and in use there for the intermediate course. It consists of instructions for the performance of a few simple experiments in each of the branches of physics, together with some information regarding general laboratory processes such as glass-blowing. There is little to distinguish the book from many of a similar kind. Fewer experiments, perhaps, are undertaken, one only—the resonance tube—constituting the whole section on sound. The instructions are clearly stated, but the printing and the diagrams leave much to be desired. The latter failing is, however, common to many books produced in India.

THE TESTING OF BUILDING STONES.

Handbuch der bautechnischen Gesteinsprüfung.

By Prof. J. Hirschwald. Erster Band. Pp. xi + 387. (Berlin: Gebrüder Borntraeger, 1911.) Price 20 marks.

IN this country, and to a great extent elsewhere, the testing of building stones has fallen short of the precision attained in the testing of other materials of construction. This has been due partly to the lack of any generally recognised standard methods, and partly to the neglect of the petrological characters peculiar to stones of different kinds.

Tests of building stones are usually made for two distinct purposes, namely, to measure their comparative resistance to mechanical stresses and to find their relative capacity of resistance to weathering.

It certain quarters it has been the practice to decry the testing of building stones on the ground that it is unnecessary, since any stone worth employing at all will be strong enough for the purpose; and as to weathering, since that may be regarded as "an act of God," it is no use troubling about it. Some, while admitting that tests may be desirable, have no faith in the methods usually employed, and suggest rather an examination of the rocks in the field and in the quarries. There is something to be said for this point of view,

but the fact remains that the behaviour of cut and dressed stone in a town building is very different from that of the rock in its native habitat. Besides, occasions will continue to arise when some sort of test is required to confirm an architect in his opinion and give him peace of mind; for none is so timid as an architect with a new and untried stone.

Except for the purpose of discovering first principles, there is practically no need to test stones that have been long in use and are well known. The quality of the untried stone does require proving. To do this satisfactorily we need sound criteria founded upon knowledge of the properties of stones already used; and we should distinguish between those parts of a structure subjected to the continued influence of moisture and those which are relatively dry.

Prof. Hirschwald has been engaged for many years upon an examination of the weather-resisting properties of German stones, as exhibited in old buildings, and by the application of great ingenuity and patience he has been able to trace the influence of the individual properties of the stone upon its durability. Upon this sound basis of experience he has formulated a very thorough-going scheme of stone-testing which, while it aims mainly at determining the degree of weather-proofness, at the same time embraces all the tests necessary for the estimation of mechanical strength.

The method used by Prof. Hirschwald is to range a large number of stones obtained from buildings into about nine grades of quality, according to their present condition, the age of the structure being taken into account. He has then examined their petrological characters, porosity, degree of softening in water, resistance to frost, and their mechanical properties both before and after soaking and freezing. By correlating the observed results with the quality scale, and eliminating the effect first of one character and then of another, he is able to state numerically the value of any one of the structural and mineralogical peculiarities of the stone.

As the result of this laborious preliminary work we have before us a means of estimating the probable weatherproofness of a stone within closer limits and with greater certainty than has hitherto been possible.

Prof. Hirschwald's earlier book, "Die Prüfung der natürlichen Bausteine auf ihre Wetterbeständigkeit," published in 1908, was out of print in the following year. The present work is practically a new and revised edition of the earlier one. Its division into two volumes of smaller size, of which vol. i. has appeared, is a great

gain to the comfort of the reader. To save expense, some of the larger plates of the earlier single volume are discarded in favour of figures in the text without any disadvantage. The work has been improved by the addition of process blocks illustrating the apparatus actually employed at the Charlottenburg laboratories, also by a fuller consideration of the tests for determining resistance to pressure, bending, shearing, and abrasion. As before, it is a storehouse of interesting numerical data concerning the properties of stone.

OUR BOOKSHELF.

A Guide to the Fossil Invertebrate Animals in the Department of Geology and Palaeontology in the British Museum (Natural History), Cromwell Road, London, S.W. Second edition. Pp. x+185+7 plates. (London: Printed by Order of the Trustees, 1911.) Price 1s.

THE second edition of Dr. F. A. Bather's guide will be even more useful than the first. It serves the student, who may never enter the British Museum galleries, as an introduction to invertebrate palaeontology, since the structure and habits of each class of animals are described, before the fossil remains are dealt with. The introductions to Trilobita and Cephalopoda may be specially mentioned. The interesting discovery of the dimorphism and double mode of reproduction of many foraminifera is stated on p. 24, with particular reference to the Nummulites. *Dibunophyllum* is assigned "stratigraphical importance" on p. 54. A new drawing of the under surface of *Eurypterus Fischeri* appears on p. 87. We note that the class Arachnida, including the Mero-stomata, intervenes between the trilobites and the Crustacea. The Crustacea receive more attention than is usually given to them; the interest of the beginner in palaeontology often falls off when he has mastered the structure of the trilobites. Crabs and lobsters then appear to him altogether trivial; Dr. Bather, however (p. 100), attracts us happily to the primitive Dromiacea, and thence to the evolution of the crabs that are now familiar to us.

The Brachiopoda follow the Arthropoda, and we finally pass to the Mollusca, the Cephalopoda being allowed thirty well-illustrated pages. The illustrations throughout are excellent, and cover fields of structure usually reserved for large and expensive textbooks.

The language employed is so accurate that one does not at first realise how much matter has been compressed into a single sentence. The comparison between the structure of a starfish and that of a sea-urchin (pp. 68 and 71) may be taken as an example. The term "flagellated chamber" on p. 29 seems a case where compression leads to inexactitude. On p. 74 we do not think that the author means to say that "some urchins seem to have taken to moving generally